

CLAIMS

1. A coherent light source, comprising:

a light source;

5 a wavelength conversion element that converts part of a fundamental wave emitted from the light source into a higher harmonic wave; and

a wavelength selecting filter that has narrow-band transmission characteristics with respect to the part of the fundamental wave not converted into the higher harmonic wave, and has transmission characteristics with respect to the higher harmonic wave,

10 wherein the part of the fundamental wave emitted from the wavelength conversion element but not converted into the higher harmonic wave is fed back to the light source by the wavelength selecting filter, and

the higher harmonic wave is emitted to the outside after passing through the wavelength selecting filter.

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2. The coherent light source according to Claim 1, wherein the wavelength selecting filter has a band pass filter and a dichroic mirror,

the band pass filter has narrow-band transmission characteristics with respect to the part of the fundamental wave not converted into the higher harmonic wave, and has transmission characteristics
20 with respect to the higher harmonic wave,

the dichroic mirror reflects the part of the fundamental wave transmitted by the band pass filter but not converted into the higher harmonic wave, and

the higher harmonic wave passes through the band pass filter and then passes through the dichroic mirror and is emitted to the outside.

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3. The coherent light source according to Claim 2, wherein the wavelength selecting filter is a confocal optical system, and

the dichroic mirror is installed in the focal plane of the confocal optical system.

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4. The coherent light source according to any of Claims 1 to 3, wherein the light source is a single-mode semiconductor laser.

5. The coherent light source according to Claim 4, wherein the cavity length of the semiconductor laser is 1 mm or more.

6. The coherent light source according to Claim 4 or 5, wherein the semiconductor laser
5 has undergone high-frequency superposition.

7. The coherent light source according to any of Claims 1 to 3, wherein the light source is a fiber laser.

10 8. The coherent light source according to any of Claims 1 to 7, wherein the transmissivity of the higher harmonic wave of the wavelength selecting filter is 80% or more.

9. The coherent light source according to any of Claims 1 to 8, wherein the selected wavelength width of the wavelength selecting filter is 0.2 nm or less.

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10. The coherent light source according to any of Claims 1 to 9, wherein the wavelength conversion element is furnished with a periodic polarization inversion structure.

11. The coherent light source according to any of Claims 1 to 10, wherein at least one of
20 the end faces of the wavelength conversion element is inclined at an angle of 3° or more with respect to the optical axis of the wavelength conversion element.

12. The coherent light source according to any of Claims 1 to 11, further comprising a focusing optical system between the light source and the wavelength conversion element,
25 wherein the focusing optical system has chromatic aberration, and focuses the higher harmonic wave and the part of the fundamental wave not converted to the higher harmonic wave at different focal points.

13. The coherent light source according to any of Claims 1 to 12, wherein the wavelength
30 conversion element including an optical waveguide.

14. The coherent light source according to Claim 13, wherein the wavelength conversion element is directly coupled to the light source.

15. The coherent light source according to Claim 13 or 14, wherein the wavelength
5 selecting filter is installed on an end face or in the interior of the optical waveguide.

16. The coherent light source according to Claim 1, wherein the wavelength conversion element including an optical waveguide,
the wavelength selecting filter has a band pass filter installed on an end face or in the interior
10 of the optical waveguide, and a dichroic mirror installed on an end face of the optical waveguide,
the band pass filter has narrow-band transmission characteristics with respect to the part of the fundamental wave not converted into the higher harmonic wave, and has transmission characteristics with respect to the higher harmonic wave,
the dichroic mirror reflects the part of the fundamental wave transmitted by the band pass
15 filter but not converted into the higher harmonic wave, and
the higher harmonic wave passes through the band pass filter and then passes through the dichroic mirror and is emitted to the outside.

17. The coherent light source according to Claim 16, wherein the thickness of the dichroic
20 mirror is 1 mm or more.

18. An optical device, having an image conversion optical system and the coherent light source according to any of Claims 1 to 17, wherein the light from the coherent light source is converted into a two-dimensional image by the optical system.

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19. The optical device according to Claim 18, wherein the image conversion optical system comprises a two-dimensional beam scanning optical system.

20. The optical device according to Claim 18, wherein the image conversion optical
30 system comprises a two-dimensional switch.